

# Flying Weather:

## *Aviation Weather Safety in the Intermountain West*



CWSU Salt Lake City

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## Thunderstorm Hazards to Aviation

*By: Rick Dittmann, Meteorologist-in-Charge, CWSU Salt Lake City*

Throughout the Great Basin and the Rockies during the warm spring and summer seasons, thunderstorms are common. They can be mesmerizing to look at, but, they all bring hazards. Those hazards can be greatly pronounced and even deadly for pilots.

By definition, a thunderstorm contains lightning which explodes air to cause the thunder we hear. Typically, the lightning is discharged because hail near the top of the storm creates an ionic or electrical imbalance which is ultimately displaced by lightning. Lightning is dangerous for everyone and hail, depending on its size can be costly to crops, vehicles, homes and businesses. But, hail can be brutally destructive to airplanes.

Besides lightning and hail, thunderstorms generate strong vertical wind currents. These updrafts and downdrafts are routinely on the order of 25-35 mph, but in severe cases can be in excess of 100 mph. Flying through a thunderstorm updraft or downdraft or its outflow can create extreme upward and downward and side to side motions. In commercial airliners, these can be injury-causing turbulence events. For smaller aircraft the results can be devastating.

Torrential rain often mixed with hail creates reduced visibility, but also can choke engines needing oxygen to fuel combustion. The clouds associated with thunderstorms can rise to great heights. Throughout the western U.S., thunderstorm tops routinely reach 35,000 feet. But, more extreme thunderstorms are noted to grow as tall as 60,000 feet. And because precipitation processes are ongoing in these clouds, icing is routine.

Visibility-reducing rain, damaging hail stones, updrafts, downdrafts and side to side winds, icing, turbulence and the ability to obscure mountains. These are the reasons thunderstorms are dangerous and should be avoided by all aviators as a matter of routine. And, reports of these phenomena relayed to air traffic control can help the next pilot avoid a dangerous situation.

### What's Inside?

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- Weather Support of the Friedman Memorial Fly-In
- High Density Altitude
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# Space Weather and Aviation

## Impacts

*By: Charlotte Dewey, Meteorologist, NWS Salt Lake City*

Aviators and navigators rely on instruments for aviation purposes that can be damaged by Space Weather.

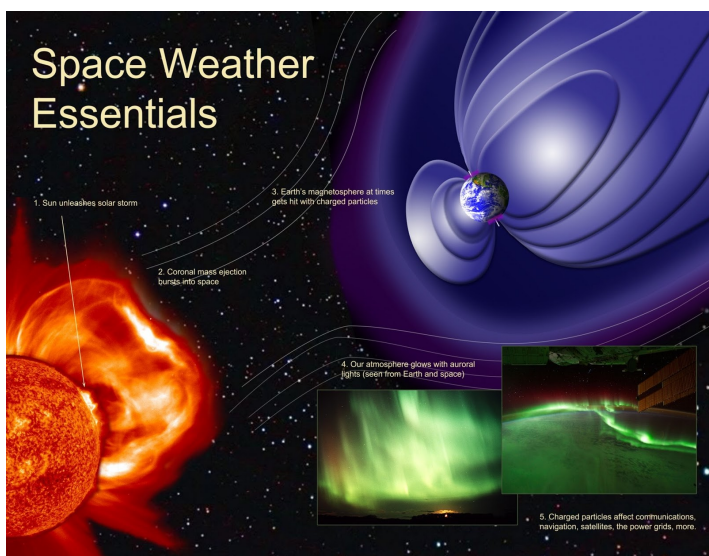
Space Weather is constant and in most cases not a concern to us here on Earth. The Solar cycle is a periodic 11-year change in the Sun's activity and appearance of sunspot counts. A period of maximum and minimum activity refers to the number of sunspots that drive the solar activity. Storming on the sun results from the number and strength of sunspots, darker and cooler areas on the surface of the sun caused by interactions with the Sun's magnetic field, and coronal mass ejections (CMEs). The Earth is shielded by a protective region called the magnetosphere, including a magnetic field. When solar wind, streams of electrically-charged particles ejecting outward from the Sun, is directed toward Earth, the magnetic field shields Earth from the strong wind. Solar wind is constantly buffeting the Earth's atmosphere and when active storming occurs such as a CME, the Sun produces streams of protons and other charged particles erupting out into space heading for Earth.

A Coronal Mass Ejection (CME) is an explosion of magnetic field and plasma from the Sun's corona. When a CME erupts from the Sun, disturbances or fluctuations to Earth's magnetic field are caused by variations in the solar wind conditions. A CME travels outward from the Sun at speeds of about 300 kilometers per second, reaching the Earth in as little as 14-17 hours. Faster CMEs erupt from large active sunspot regions. Impacts from CMEs may include deteriorated GPS accuracy and outages to the power grid. Most CMEs that impact the Earth's magnetosphere will favor the generation of storming which usually results in the visibility of the Aurora Borealis or Aurora Australis which is a positive impact seen here on Earth.

Solar flares are another type of storming on the Sun which can cause degraded services here on Earth. A highly ionized section of Earth's atmosphere can become bombarded by x-ray energy when a solar flare occurs, resulting in loss or poor quality high frequency radio communications. This mostly impacts aircraft flying over large bodies of water or in remote areas of the day lit side of Earth. Impacts from these events can persist for minutes up to a few hours, depending on the magnitude of the flare. Events of this sort can happen several times a day during the active space weather cycle.

Several systems and instruments aviators and navigators rely heavily on are GPS and radio communications, including high frequency radios. Having the awareness for potential storming and outages before planning for a flight can be the difference in flying to a planned destination or becoming off course, or worse, colliding with a mountain. The Space Weather Prediction Center (SWPC) contacts the Aviation Weather Center (AWC) to alert flights about potential storming that may affect flights.

For more information on space weather, including current alerts, check out [www.swpc.noaa.gov](http://www.swpc.noaa.gov).



# Enhanced Aviation Weather Support: The Friedman Memorial Fly-In

*By: Sarah Rogowski, NWS CWSU Salt Lake City*

Each July, The Friedman Memorial Fly-In gathers business, financial, and political leaders in Sun Valley, ID. What does this have to do with Aviation Weather? Well, a significantly higher-than-normal amount of air traffic converges on a small airport, presenting air traffic control with a large increase in workload that can be further impacted by weather. During winter, many smaller airports see an increase in traffic volume due to ski resorts. The biggest challenge for these airports when it comes to weather impacts are snow and low clouds. The summer months are a different challenge.

During the Friedman Memorial Fly-In, thunderstorms are often the biggest impact on air traffic both en route and at the terminal. Planes approaching or departing from Sun Valley can encounter thunderstorms and have to deviate, creating headaches all around. Another weather impact we have seen is wildfire. A wildfire will result in an area of restricted flight as well as smoke that can reduce visibility aloft. Thunderstorms in the area of wildfires can result in strong winds that spread fire and smoke, increasing the size of the area impacting aircraft.



Aerial Photo of Friedman Memorial Airport from [visitsunvalley.com](http://visitsunvalley.com)

Sun Valley Airport has no radar coverage below 12,000 feet and has significant mountainous terrain. This creates additional delay when aircraft can't be separated by visual means or when the aircraft cannot fly approaches visually. Reduced visibility and low ceilings have a greater impact to aviation at an airport without full radar coverage.

The CWSU meteorologist is on-hand to make sure those working with the increased traffic know about potential weather impacts. He/she provides the most current forecast available for planning. We provide the bigger-picture outlooks several days in advance and coordinate with the NWS Weather Forecast Office in Pocatello, ID, for their local expertise in both the public and specific aviation forecast (TAF) at Sun Valley Airport. (The valid period for the TAF is now 30-hours.) Information specific to Sun Valley airport is incorporated into the twice-daily scheduled briefings, and updates are provided throughout the day. During active weather, CWSU meteorologists are called upon for up-to-the-minute information and their forecast experience to help mitigate the impacts. We utilize automated surface observations, weather radars in Pocatello and Boise, and web cameras to provide the most complete picture possible.



# High Density Altitude

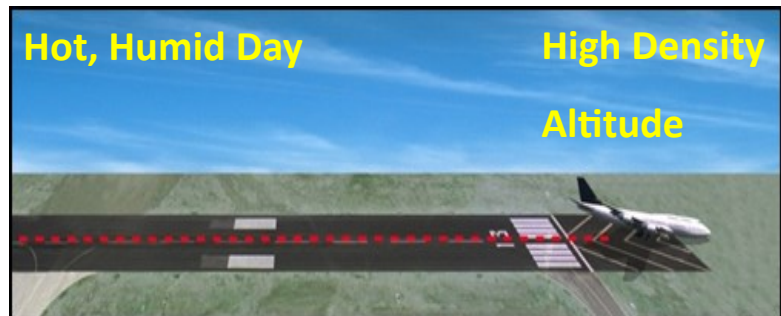
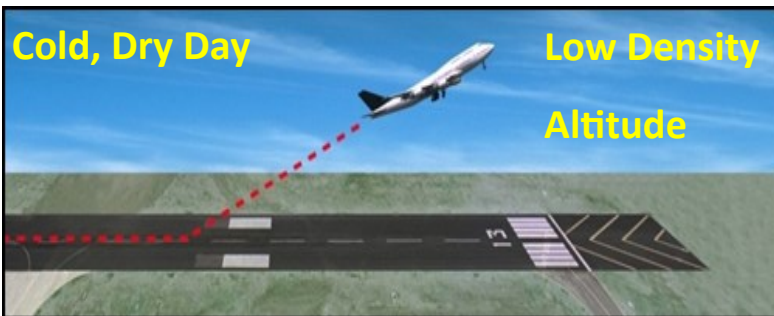


**High density altitude accounts for 7.3% of all U.S. aviation weather-related accidents.**

**Density Altitude** – The altitude in the standard atmosphere at which the air has the same density as the air at the point in question. An aircraft will have the same performance characteristics as it would have in standard atmosphere at this altitude.

**High Density Altitude** – A condition of the atmosphere that reduces an aircraft's performance capability to below a level of standard performance at a specified altitude.

**Service Ceiling** – The maximum density altitude where the best rate-of-climb airspeed will produce a 100 feet-per-minute climb a maximum weight while in a clean configuration with maximum continuous power.



**Air density is determined by: Pressure, Temperature, and Humidity.**

On a hot, muggy day, the air becomes “thinner” or less dense, and its density at a pilot’s location is equivalent to a higher altitude in the standard atmosphere.

- Thus the term “high density altitude.”

Pilots must determine if high density altitude will impact their flight by:

- Calculating density altitude
- Checking their aircraft performance charts.

## High Density Altitude Hazards

- Reduced Power (engine ingests less air to support combustion)
- Reduced Thrust (propeller has less “grip” and jet exhausts less mass)
- Reduced Lift (air exerts less upward force on the airfoils)
- Longer takeoff roll is required
- Smaller rate of climb
- Lowers aircraft’s service ceiling
- Longer landing roll required

*Material from: NOAA National Weather Service Warning Decision Training Branch*

# CWSU Salt Lake City Presents at the 2017 Southwest Aviation Weather Safety (SAWS) VII Workshop

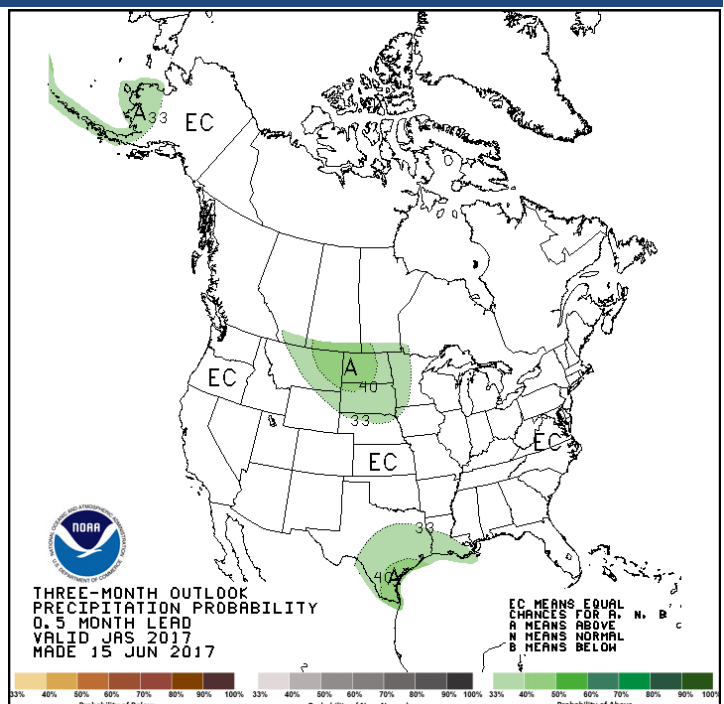
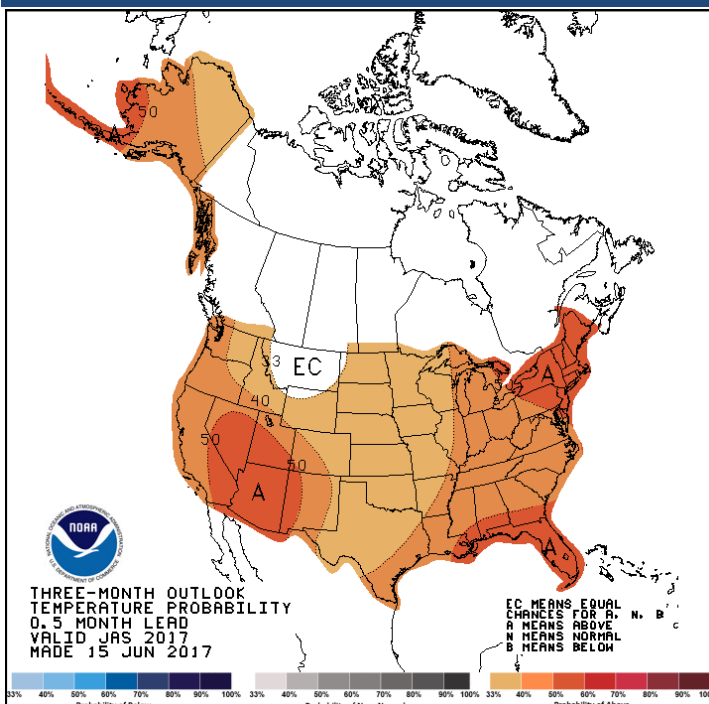
By: Sarah Rogowski, NWS CWSU Salt Lake City

Every-other summer, several NWS offices across the Southwest come together to host an aviation-focused workshop. This workshop invites meteorologists from the NWS as well as airlines, the NTSB, and NASA, to come together with pilots to discuss aviation forecasts and hazards. This two-day event is focused on the meteorology for day 1. The second day has more pilot participation who can earn WINGS credit. SAWS is a great way for meteorologists to be reminded of WHO is using our information and HOW it is being used and gives pilots a renewed perspective on what the forecasters are doing day-to-day to help keep pilots weather-ready.

CWSU Salt Lake City presented at day 2 of the workshop, focusing on available weather data from the NWS presented on our home pages and social media.



## Seasonal Outlook for July — August — September 2017



# Aviation Weather Outreach - Helping Controllers AND Pilots

By: Sarah Rogowski, Meteorologist, NWS CWSU Salt Lake City

CWSU forecasters provide seasonal weather refresher training to air traffic controllers twice a year in what are called "Mandatory Briefings." CWSU forecasters provide brief presentations on the primary weather impacts of different seasons. In April, we talked about Spring and Summer weather concerns, including thunderstorms, high density altitude, and smoke and dust.

Sarah Rogowski, CWSU Salt Lake City, teamed up with Charlotte Dewey, WFO Salt Lake City, to discuss weather impacts to air traffic for the Capstone Class at Westminster College. We discussed the role of an aviation meteorologist along with how weather not only impacts local aviation but also traffic within the National Airspace (NAS).



***There are plenty of ways to keep up  
with aviation weather!***

**[aviationweather.gov](http://aviationweather.gov)**

**[weather.gov/zlc](http://weather.gov/zlc) (Check out our new look!)**

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**Safe Flying!**

**Questions / Comments? [w-zlc.webmaster@noaa.gov](mailto:w-zlc.webmaster@noaa.gov)**